

The LLNL-CALIOPE Program

Lyn Pleasance

Lawrence Livermore National Laboratory  
P.O. Box 808, L-394  
voice: 510/422-6155  
fax: 510/422-2499

Laser-based remote standoff detection and identification of chemical effluents associated with nuclear production and processing capabilities requires the development of LIDAR systems with significantly improved sensitivity. CALIOPE (Chemical Analysis by Laser Interrogation of Chemical Effluents) is a DOE sponsored program to develop laser-based, remote sensing systems for detection of effluents specifically associated with nuclear materials development and processing activities. This program is supported by the integrated activities at five DOE National Laboratories; Lawrence Livermore, Los Alamos, Sandia, Brookhaven, and Pacific Northwest.

LLNL is developing remote sensing techniques and hardware for the mid-infrared (3-5 micron) spectral region. New infrared laser sources based on nonlinear optical parametric oscillators (OPOs) are being developed to provide multiple frequency output for multi-line DIAL approaches to chemical detection. In conjunction with this research, advanced pulse shaping techniques utilizing spatial light modulators have been demonstrated and hold promise for delivering multiple laser frequencies simultaneously as a seed laser source for the OPO or, alternatively, for direct remote sensing applications. The pulse shaping capability has also enabled the investigation of various modulation approaches for potentially enhancing the sensitivity of the LIDAR system. The utility and implementation of multi-line DIAL for the CALIOPE Program will be presented, as well as our progress in the above mentioned research areas.

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